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ABSTRACT

This document, which reflects Mississippi's statutory requirement that instructional programs be based on core curricula and performance-based assessment, contains outlines of the instructional units required in local instructional management plans and daily lesson plans for machine tool operation/machine shop I and II. Presented first are a program description and course outlines. Section I contains curriculum frameworks for both courses, and section II contains outlines of the instructional units required in each course. Machine Tool Operation and Machine Shop I contains the following 11 units: (1) orientation; (2) leadership and personal development; (3) safety; (4) shop math; (5) measuring tools and instruments; (6) hand and bench tools; (7) blueprint reading; (8) lathes; (9) lathe operations; (10) milling machines; and (11) milling machine operations. The second-level course contains these units: (1) orientation; (2) safety; (3) advanced leadership; (4) employability skills; (5) layout and construction; (6) advanced lathe operations; (7) advanced vertical milling operations; (8) surface grinding machines; and (9) computerized numerical control. Each unit includes suggested time on tasks, competencies and objectives, teaching strategies, assessment strategies, and resources. Recommended tools and equipment are listed in section III. Appended are lists of related academic topics and workplace skills for the 21st century and student competency profiles for both courses. (KC)

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ED 397 322

Mississippi Curriculum Framework for Machine Tool Operation/ Machine Shop

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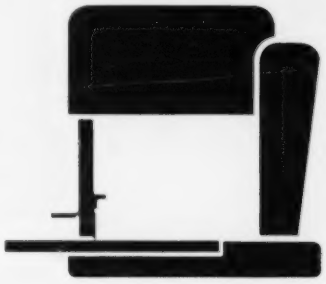

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Secondary Vocational and Technical Education 1996

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MISSISSIPPI

CURRICULUM FRAMEWORK

FOR

MACHINE TOOL OPERATION/MACHINE SHOP

(PROGRAM CIP: 48.0503 - Machine Shop Assistant)

SECONDARY PROGRAMS

1996

July 30, 1996

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FOREWORD

The courses in this document reflect the following statutory requirements as found in Section 37-3-49, Mississippi Code of 1972, as amended:

> The State Department of Education shall provide an instructional program and establish guidelines and procedures for managing such programs in the public schools as part of the State Program of Educational Accountability and Assessment of Performance. . .
>
> The department shall provide that such program or guidelines . . . are enforced through the performance-based accreditation system.
>
> The local school board must adopt the objectives that will form the core curriculum that will be systematically delivered throughout the district.
>
> Standards for student performance must be established for each core objective in the local program and those standards establish the district's definition of mastery for each objective.
>
> There shall be an annual review of student performance in the instructional program against locally established standards.

Each secondary vocational-technical course consists of a series of instructional units which focus on a common theme. All units have been written using a common format which includes the following components:

- Unit Number and Title
- Suggested Time on Task - The number of days of instruction that should be required to teach the competencies and objectives of the unit. For secondary occupational programs, a "day" represents a two-period block of instruction.
- Competencies and Suggested Objectives
  - A **Competency** represents a general concept of performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to master all competencies in the curriculum framework in order to satisfactorily complete the course.
  - The **Suggested Objectives** represent the enabling and supporting knowledge and performances that will indicate mastery of the competency.
- Suggested Teaching Strategies - This section of each unit indicates strategies that can be used to enable students to master each suggested objective. Teachers should feel free to modify or enhance these suggestions based on needs of their students and resources available in order to provide optimum learning experiences for their students.

- Suggested Assessment Strategies - This section indicates strategies that can be used to measure student mastery. Examples of suggested strategies could include classroom discussions, laboratory exercises, and student assignments. Again, teachers should feel free to modify or enhance these suggested assessment strategies based on local needs and resources.
- Suggested Resources - This section indicates some of the primary instructional resources that may be used to teach the competencies and suggested objectives. Again, these resources are suggested and the list may be modified or enhanced based on needs and abilities of students and on available resources.

The following guidelines were used in developing the curriculum framework in this document and should be considered in developing local instructional management plans and daily lesson plans:

- The content of the courses in this document reflects approximately 75 percent of the time allocated to each course. For a one-year course, this means that the content of the existing units of instruction should represent approximately 135 days of instruction. The remaining 25 percent of each course should be developed at the local district level and may reflect:
  - Additional units of instruction within the course related to topics not found in the state framework.
  - Activities which develop a higher level of mastery on the existing competencies and suggested objectives.
  - Activities and instruction related to new technologies and concepts that were not prevalent at the time the current framework was developed/revised.
  - Activities which implement components of the Mississippi Tech Prep Initiative, including integration of academic and vocational-technical skills and coursework, school-to-career transition activities, and articulation of secondary and postsecondary vocational-technical programs.
  - Individualized learning activities, including work site learning activities, to better prepare individuals in the courses for their chosen occupational area.
- Sequencing of the units of instruction within a course is left to the discretion of the local district. Naturally, foundation units related to topics such as safety, tool and equipment usage, and other fundamental skills should be taught first. Other units related to specific skill areas in the course, however, may be sequenced to take advantage of seasonal and climatic conditions, resources located outside of the school, and other factors.

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PROGRAM DESCRIPTION

MACHINE TOOL OPERATION/MACHINE SHOP

(Program CIP: 48.0503 - Machine Shop Assistant)

Machine Tool Operation/Machine Shop prepares a student for entry-level employment in machining careers and/or for further study at the postsecondary level. Emphasis is on safety, math, measuring tools and instruments, hand and bench tools, blueprint reading, lathe operations, milling operations, layout, grinding machine operations, and CNC.

COURSE OUTLINE

MACHINE TOOL OPERATION I/MACHINE SHOP I

Unit No.	Unit Name	No. of Days
Unit 1	Orientation	5
Unit 2	Leadership and Personal Development	5
Unit 3	Safety	5
Unit 4	Shop Math	5
Unit 5	Measuring Tools and Instruments	10
Unit 6	Hand and Bench Tools	5
Unit 7	Blueprint Reading	10
Unit 8	Lathes	20
Unit 9	Lathe Operations	40
Unit 10	Milling Machines	10
Unit 11	Milling Machine Operations	20

MACHINE TOOL OPERATION II/MACHINE SHOP II

Unit No.	Unit Name	No. of Days
Unit 1	Orientation	2
Unit 2	Safety	3
Unit 3	Advanced Leadership	1
Unit 4	Employability Skills	2
Unit 5	Layout and Construction	17
Unit 6	Advanced Lathe Operations	47
Unit 7	Advanced Vertical Milling Operations	20
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SECTION I:

CURRICULUM FRAMEWORK

FOR

MACHINE TOOL OPERATION/MACHINE SHOP

CURRICULUM FRAMEWORK

Course Name: Machine Tool Operation I/Machine Shop I

Course CIP Code: 48.0503

Course Description: Machine Tool Operation I/Machine Shop I is the entry level course of the secondary Machine Tool Operations/Machine Shop program. Students in this course will gain foundation competencies related to orientation, safety, leadership and personal development, basic measurements, blueprint reading, tools, lathe, and milling machines. (2 - 2½ Carnegie units, depending upon time spent in the course)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Describe employment opportunities and responsibilities.
   a. Describe employment opportunities including potential earnings, employee benefits, job availability, places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students by the Vocational Industrial Clubs of America (VICA).
   a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner.
   b. Describe the purposes of VICA.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6
4. Identify desirable personal behavior and characteristics.
   a. Identify desirable personality traits when serving the public.
   b. Identify desirable personality traits when communicating with employees, supervisors, and other employees.
   c. Identify desirable characteristics of the personal work ethic.

   Related Academic Topics (See Appendix A): C4, C5, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

5. Identify legal requirements for participation in the occupation.
   a. Describe ways to avoid legal liability problems in the occupation.
   Related Academic Topics (See Appendix A): C3, C4, C6
   Workplace Skills (See Appendix B): WP4, WP6
6. Describe personal safety rules for working in the machine tool industry.
   a. Identify and apply terms and definitions for safety.
   b. Identify provisions of the OSHA Act of 1970.
   c. Identify OSHA inspections and citations.
   d. Identify why citations are given.
   e. Identify accidents including causes and prevention.
   f. Identify general safety procedures.
   g. Identify causes of electrical hazards.
   h. Identify proper methods for moving heavy items.
   i. Identify and apply emergency first aid, if necessary.
   j. Discuss Mississippi eye safety law and its requirements.
   k. Apply eye safety procedures.
   l. Discuss hazardous material regulations.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3
7. Develop the ability to do mathematical operations using fractions.
   a. Convert fractions to least common denominator.
   b. Add a list of fractions.
   c. Subtract fractions.
   d. Multiply fractions.
   e. Divide fractions.
   f. Convert fractions to decimal number.
   Related Academic Topics (See Appendix A): C2, C5, C6, M1, M7
   Workplace Skills (See Appendix B): WP5, WP6
8. Develop the ability to do mathematical operations using decimal numbers.
   a. Convert decimal numbers to fractions.
   b. Add a list of decimals.
   c. Subtract a list of decimals.
   d. Multiply decimals.
   e. Divide decimals.
   Related Academic Topics (See Appendix A): C2, C5, C6, M2, M7
   Workplace Skills (See Appendix B): WP5, WP6
9. Demonstrate the ability to do basic mathematical calculations related to machine shop operations.
   a. Convert metric to English measurements.
   b. Solve basic angles and sides.
   c. Calculate the amount of material for a given project.
   d. Compute distances according to a drawn plan.
   Related Academic Topics (See Appendix A): C2, C5, C6, M1, M5, M7
   Workplace Skills (See Appendix B): WP5, WP6

10. Demonstrate the ability to use and read a machinist rule.
    a. Read a rule to the nearest 1/32nd inch.
    b. Lay out lines with a rule.
    c. Describe the care and use of various rules.
    Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
    Workplace Skills (See Appendix B): WP5, WP6
11. Demonstrate the ability to identify and use the different types of micrometers.
    a. Identify common types of micrometers and their use.
    b. State the rules for use and care of micrometers.
    c. Make and read measurements with different micrometers.
    Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
    Workplace Skills (See Appendix B): WP5, WP6
12. Demonstrate the ability for the use and care of dial indicators.
    a. Explain the use of dial indicators.
    b. Identify when to use certain dial indicators.
    c. Explain the function of a dial indicator.
    d. Explain the procedures for the care of dial indicators.
    e. Take and record readings from different dial indicators.
    Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
    Workplace Skills (See Appendix B): WP5, WP6
13. Demonstrate the ability to use the height gauge.
    a. Explain the use of the height gauge and digital caliper.
    b. Explain the purposes of the height gauge and digital caliper.
    c. Discuss the care and maintenance of the height gauge.
    d. Take and record readings from the height gauge.
    e. Discuss the use of the electronic height gauge and digital caliper.
    f. Discuss care and use of a surface plate.
    Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
    Workplace Skills (See Appendix B): WP5, WP6
14. Demonstrate the ability to identify hand tools and the rules for safe use of hand and power tools.
    a. Identify hand tools associated with machine tool operation.
    b. Identify safety rules associated with hand and power tools.
    Related Academic Topics (See Appendix A): C1, C4, C5
    Workplace Skills (See Appendix B): WP2, WP3
15. Determine the sizes of threads.
    a. State the safety rules in the use of thread cutting.
    b. Determine the sizes of drills from a chart and/or formulas.
    c. Produce internal threads by hand tapping.
    d. Produce external threads with a hand die.
    Related Academic Topics (See Appendix A): C1, C4, C5, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
16. Demonstrate the ability to safely use bench and pedestal grinders.
    a. State the safety rules in the use of grinding wheels.

b. Check a grinding wheel for cracks.
c. Dress a grinding wheel.
d. Grind a high speed tool bit.

Related Academic Topics (See Appendix A): C1, C4, C5
Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6

17. Demonstrate the ability to safely use band saws.
    a. State the safety rules in the use of band saws.
    b. Identify the types of power saws.
    c. List the factors which determine blade selection.
    d. Cut given stock with a horizontal band saw.
    e. Cut given stock with a vertical band saw.

    Related Academic Topics (See Appendix A): C1, C4, C5, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
18. Demonstrate the ability to safely use drill presses.
    a. State the safety rules in the use of drill presses.
    b. Identify the different types of drill presses.
    c. Explain the operations done on a drill press.
    d. List the factors which determine cutting speeds (rpm) for drilling.
    e. Drill and ream holes to layout.

    Related Academic Topics (See Appendix A): C1, C4, C5, M7
    Workplace Skills (See Appendix B): WP2, WP3
19. Demonstrate the ability to identify symbols, their abbreviations, and the alphabet of lines.
    a. Identify symbols used on blueprints.
    b. Identify abbreviations as used on blueprints.
    c. Identify the alphabet of lines.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
20. Demonstrate the ability to identify and sketch the three principal views.
    a. Identify the top, front, and right side views.
    b. Sketch the third view when two views are given.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
21. Demonstrate the ability to identify and use basic dimensions and tolerance.
    a. Identify the basic dimensions of a drawing.
    b. Place basic dimensions on a drawing.
    c. Identify tolerances on a drawing.
    d. Read tolerances on a drawing.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
22. Demonstrate the ability to list the types of information found in a title block.
    a. Identify the parts of a title block.
    b. Locate the various parts of a title block.
    c. Complete a title block.

Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
Workplace Skills (See Appendix B): WP2, WP3

23. Identify the parts, rules, and care of the engine lathe.
    a. Identify the major parts of the engine lathe.
    b. List rules for the safe use of the engine lathe.
    c. List rules for the care and cleaning of the engine lathe.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
24. Describe the basic lathe operations.
    a. Explain the turning of a piece of stock.
    b. Describe how to chuck a piece of stock.
    c. Describe facing, center drilling, filing, tapping, and cutoff.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
25. Explain the advantages and disadvantages of carbide tip cutting tools and demonstrate how to free-hand grind a high speed steel (hss) turning tool.
    a. Discuss the advantages of carbide tip cutting tools.
    b. Discuss the disadvantages of carbide tip cutting tools.
    c. Explain the use of carbide tip cutting tools.
    d. Demonstrate how to free-hand grind an hss turning tool.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
26. Set up a lathe and determine the rpm and feed rate.
    a. Set up the lathe according to manufacturer's specifications.
    b. Explain the procedure for determining the rpm and feed rate.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
27. Perform wet and dry cuts.
    a. Explain the procedures for making wet and dry cuts.
    b. Explain the differences between wet and dry cuts
    c. Make wet and dry cuts.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP6
28. Install a 4 jaw chuck on a lathe.
    a. Demonstrate safety procedures to be followed when installing a 4 jaw chuck.
    b. Install a 4 jaw chuck.

    Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
29. Operate the lathe.
    a. Mount and align a part in a 4 jaw chuck on a lathe to instructor's specifications.
    b. Perform a facing operation.
    c. Face a part to length.

d. Perform a straight turning operation.
e. Perform chamfer operations.
f. Perform a center drilling operation.
g. Perform a knurling operation.
h. Perform a cutoff operation.
i. Tap a blind hole.
j. Cut external threads with a die on the lathe.

Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6

30. Demonstrate the ability to differentiate between the types of milling machines.
    a. Identify the different types of milling machines.
    b. Explain the use of each type of milling machine.

    Related Academic Topics (See Appendix A): C1, C4, C5
    Workplace Skills (See Appendix B): WP2, WP3, WP6
31. Explain and apply safety rules in the use of milling machines.
    a. Explain safety rules of milling machines.
    b. Discuss the application of safety rules for milling machines.

    Related Academic Topics (See Appendix A): C1, C4, C5
    Workplace Skills (See Appendix B): WP2, WP3, WP6
32. Identify the parts, cutting tools, and basic maintenance of a vertical milling machine.
    a. Identify the major parts of a vertical mill to include table, motor, ram, column, base, and knee.
    b. Identify the following cutting tools used on a vertical mill: double end two-flute end mill, four flute end mill, center drill, and fly cutter.
    c. Clean and lubricate a vertical mill following manufacturer's specifications.
    d. Determine the rpm and feed rate.

    Related Academic Topics (See Appendix A): C1, C4, C5
    Workplace Skills (See Appendix B): WP2, WP3, WP6
33. Identify the major parts of a horizontal mill and changing of the cutters.
    a. Describe the major parts including overarm, spindle, start/stop switches, overarm support, table, saddle, knee, elevating screw housing, base, knee motor drive, spindle reversing lever, high/neutral/low selector lever, and column.
    b. Change the cutters according to manufacturer's specifications.

    Related Academic Topics (See Appendix A): C1, C4, C5
    Workplace Skills (See Appendix B): WP2, WP3, WP6
34. Identify vertical milling machine operations and set up milling machine.
    a. Identify operations to include end milling, side milling, slotting, drilling, reaming, boring, and fly cutting.
    b. Set up a vertical milling machine for operation by mounting cutters, and cutter holders, and mounting and aligning a swivel vise.

    Related Academic Topics (See Appendix A): C1, C4, C5, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP4, WP6

35. Demonstrate the ability to perform operations on a milling machine.
    a. Perform a side milling operation to specifications.
    b. Perform an end milling operation to specifications.
    c. Perform a fly cut to specifications.
    d. Perform a surfacing/cutting operation with a horizontal mill to specifications.

    Related Academic Topics (See Appendix A): C1, C4, C5, M7
    Workplace Skills (See Appendix B): WP2, WP3, WP4, WP6

CURRICULUM FRAMEWORK

Course Name: Machine Tool Operation II/Machine Shop II

Course CIP Code: 48.0509

Course Description: Machine Tool Operation II/Machine Shop II is the second year of the secondary Machine Tool Operation/Machine Shop program. Students in this course will gain additional competencies related to orientation, safety, advanced leadership and personal development, employability skills, layout and project construction, advanced lathe operations, advanced vertical milling operations, grinding machines, grinding operations, and CNC. (2-2½ Carnegie Units, depending upon time spent in the course)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Describe employment opportunities and responsibilities.
   a. Describe employment opportunities including potential earnings, employee benefits, job availability, places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Describe personal safety rules for working in the machine tool industry.
   a. Identify and apply terms and definitions for safety.
   b. Identify provisions of the OSHA Act of 1970.
   c. Identify OSHA inspections and citations.
   d. Identify why citations are given.
   e. Identify accidents including their causes and prevention.
   f. Identify general safety procedures.
   g. Identify causes of electrical hazards.
   h. Identify proper methods for moving heavy items.
   i. Identify and apply emergency first aid, if necessary.
   j. Discuss Mississippi eye safety law and its requirements.
   k. Apply eye safety procedures.
   l. Discuss hazardous material regulations.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3

4. Develop advanced leadership and organizational skills.
   a. Identify VICA leadership and skills competition activities.
   b. Identify similarities between VICA leadership skills and workplace leadership skills.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6
5. Develop employability skills.
   a. Prepare a resume containing essential information.
   b. Complete a job application form.
   c. Explain procedures for job interviews using correct job etiquette.
   d. Demonstrate the role of an applicant in a job interview.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
6. Demonstrate the ability to label tools, instruments, and procedures in performing a layout.
   a. Label the tools and instruments used in performing a layout.
   b. Describe the factors to be considered in doing a layout.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
7. Lay out and construct a project.
   a. Perform a layout to instructor's specifications.
   b. Construct a project using the instructor's approved layout.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
8. Demonstrate the ability to perform tasks on the lathe.
   a. Turn between centers.
   b. Turn a taper with a compound rest.
   c. Perform a boring operation.
   d. Cut V-sharp external threads.
   e. Pick up threads.
   f. Cut V-sharp internal threads.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3
9. Demonstrate the ability to perform tasks on the milling machine.
   a. Mill a key seat.
   b. Mill a given angle.
   c. Perform a straight boring operation.
   d. Align the head square to the table.
   e. Perform mill operation with head tilted to 45 degrees.
   f. Perform dividing head operations to instructor's specifications.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3
10. Demonstrate the ability to utilize surface grinding machines.
    a. Define grinding machine operations.

b. Identify different types of grinding wheels and their applications.
c. List reasons for truing and balancing grinding wheels.
d. Identify the major parts of a surface grinder and their functions.
e. State rules of grinding machine safety.

Related Academic Topics (See Appendix A): C1, C3, C4, C6
Workplace Skills (See Appendix B): WP2, WP3, WP6

11. Demonstrate the ability to set up and operate grinding machines.
    a. Set up a grinding machine to meet a specific job.
    b. Operate the controls of grinding machines as per instructor's specifications.
    c. Dress a wheel flat.
    d. Grind a piece flat and parallel.
    e. Grind a workpiece to instructor's specifications.

    Related Academic Topics (See Appendix A): C1, C3, C4, C6
    Workplace Skills (See Appendix B): WP2, WP3, WP6
12. Develop the ability to describe CNC, including the codes and the input of a prewritten program.
    a. Describe the operations of CNC.
    b. Describe codes used in a CNC machine.
    c. Input a prewritten program into a PC.
    d. Print a hard copy of the program.

    Related Academic Topics (See Appendix A): C1, C3, C4, C6
    Workplace Skills (See Appendix B): WP2, WP3, WP6
13. Demonstrate the ability to operate a CNC lathe and CNC mill.
    a. Use software and monitor to debug the program.
    b. Download program to a CNC lathe and/or CNC mill.
    c. Execute the program on a CNC machine.

    Related Academic Topics (See Appendix A): C1, C3, C4, C6
    Workplace Skills (See Appendix B): WP2, WP3, WP6

SECTION II:

CURRICULUM GUIDE

FOR

MACHINE TOOL OPERATION/MACHINE SHOP

MACHINE TOOL OPERATION I/MACHINE SHOP I

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 1: ORIENTATION (5 days)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Describe employment opportunities and responsibilities.
   a. Describe employment opportunities including potential earnings, employee benefits, job availability, places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Describe local program and vocational center policies and procedures.*
   a. *Review and discuss applicable rules and regulations.*
2. *Describe employment opportunities and responsibilities.*
   a. *Have students survey job opportunities through employer visits, resource person(s), telephone calls, and/or field trip with report to the class.*
   b. *Have resource person speak to students regarding requirements for the jobs, such as punctuality, customer relations, following directions, etc.*

Suggested Assessment Strategies:

1. *Describe local program and vocational center policies and procedures.*
   a. *Test on applicable rules and regulations.*
2. *Describe employment opportunities and responsibilities.*
   a. *Oral and written report on employment opportunities.*
   b. *Oral and written report on employee responsibilities.*

Suggested References:

Local Administrative Policies and Procedures

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 2: LEADERSHIP AND PERSONAL DEVELOPMENT (5 days)

Competencies and Suggested Objectives:

1. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students by the Vocational Industrial Clubs of America (VICA).
   a. State procedures of leadership used in organizational meetings to reach an agreement in an orderly manner.
   b. Describe the purposes of VICA.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6
2. Identify desirable personal behavior and characteristics.
   a. Identify desirable personality traits when serving the public.
   b. Identify desirable personality traits when communicating with employees, supervisors, and other employees.
   c. Identify desirable characteristics of the personal work ethic.

   Related Academic Topics (See Appendix A): C4, C5, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Identify legal requirements for participation in the occupation.
   a. Describe ways to avoid legal liability problems in the occupation.

   Related Academic Topics (See Appendix A): C3, C4, C6
   Workplace Skills (See Appendix B): WP4, WP6

Suggested Teaching Strategies:

1. *State procedures of leadership to reach an agreement in an orderly manner and personal development opportunities provided students by VICA.*
   a. Allow students to attend a formal meeting to observe "Robert's Rules of Order" in operation. Give handout on procedures. Encourage classroom discussion on procedures.
   b. Discuss leadership opportunities.
2. *Identify desirable personal behavior and characteristics.*
   a. Conduct a class discussion involving personality traits.
   b. Compare public personality traits versus employee personality traits.
   c. Have students interview someone outside school to identify the application of personal work ethics.
3. *Identify legal requirements for participation in the occupation.*
   a. Discuss with students liabilities that may be incurred while not meeting standards and ethics.

Suggested Assessment Strategies:

1. *State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students by VICA.*
   a. *Oral and/or written review.*
   b. *Oral and/or written review.*
2. *Identify desirable personal behavior and characteristics.*
   a. *Have students role play desirable personality traits.*
   b. *Oral and/or written review.*
   c. *Oral and/or written review.*
3. *Identify legal requirements for participation in the occupation.*
   a. *Oral and/or written review.*

Suggested References:

VICA. Official Guide for VICA. Washington, D.C.: Vocational Industrial Clubs of America (VICA).

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 3: SAFETY **(5 days)**

Competencies and Suggested Objectives:

1. Describe personal safety rules for working in the machine tool industry.
   a. Identify and apply terms and definitions for safety.
   b. Identify provisions of the OSHA Act of 1970.
   c. Identify OSHA inspections and citations.
   d. Identify why citations are given.
   e. Identify accidents including their causes and prevention.
   f. Identify general safety procedures.
   g. Identify causes of electrical hazards.
   h. Identify proper methods for moving heavy items.
   i. Identify and apply emergency first aid, if necessary.
   j. Discuss Mississippi eye safety law and its requirements.
   k. Apply eye safety procedures.
   l. Discuss hazardous material regulations.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Describe personal safety rules for working in the machine tool industry.*
   a. Review and discuss applicable rules and regulations on safety.
   b. Pass out OSHA provisions and discuss with students.
   c. Discuss OSHA inspections and citations.
   d. Discuss why citations are given and how to prevent them.
   e. Describe accident procedures including getting help, basic first aid, and accident report form.
   f. Pass out safety tests and discuss with students. (Note: Safety tests must be passed with 100% accuracy.)
   g. Describe hazards of electrical shock including effects of current, shock avoidance techniques, and shock treatment procedures.
   h. Describe the proper procedure for moving heavy items.
   i. Review the basic requirements of emergency first aid.
   j. Review and discuss the state eye safety legislation.
   k. Describe how the eye safety procedures will be done.
   l. Review the hazardous material regulations.

Suggested Assessment Strategies:

1. *Describe personal safety rules for working in the machine tool industry.*
   a. *Oral and/or written exercise.*
   b. *Oral and/or written exercise.*
   c. *Oral and/or written exercise.*
   d. *Oral and/or written exercise.*
   e. *Oral and/or written exercise.*
   f. *Oral and/or written exercise.*
   g. *Oral and/or written exercise.*
   h. *Written and/or oral exercise.*
   i. *Written and/or oral exercise.*
   j. *Written and/or oral exercise.*
   k. *Written and/or oral exercise.*
   l. *Written and/or oral exercise.*

Suggested References:

Local Publication, Safety Handbook, Mississippi Eye Safety Regulations

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 4: SHOP MATH **(5 days)**

Competencies and Suggested Objectives:

1. Develop the ability to do mathematical operations using fractions.
   a. Convert fractions to least common denominator.
   b. Add a list of fractions.
   c. Subtract fractions.
   d. Multiply fractions.
   e. Divide fractions.
   f. Convert fractions to decimal number.
   Related Academic Topics (See Appendix A): C2, C5, C6, M1, M7
   Workplace Skills (See Appendix B): WP5, WP6
2. Develop the ability to do mathematical operations using decimal numbers.
   a. Convert decimal numbers to fractions.
   b. Add a list of decimals.
   c. Subtract a list of decimals.
   d. Multiply decimals.
   e. Divide decimals.
   Related Academic Topics (See Appendix A): C2, C5, C6, M2, M7
   Workplace Skills (See Appendix B): WP5, WP6
3. Demonstrate the ability to do basic mathematical calculations related to machine shop operations.
   a. Convert metric to English measurements.
   b. Solve basic angles and sides.
   c. Calculate the amount of material for a given project.
   d. Compute distances according to a drawn plan.
   Related Academic Topics (See Appendix A): C2, C5, C6, M1, M5, M7
   Workplace Skills (See Appendix B): WP5, WP6

Suggested Teaching Strategies:

1. *Develop the ability to do mathematical operations using fractions.*
   a. Demonstration of how to do the calculations. Handouts with discussion.
   b. Demonstration of how to do the calculations. Handouts with discussion.
   c. Demonstration of how to do the calculations. Handouts with discussion.
   d. Demonstration of how to do the calculations. Handouts with discussion.
   e. Demonstration of how to do the calculations. Handouts with discussion.
   f. Demonstration of how to do the calculations. Handouts with discussion.
2. *Develop the ability to do mathematical operations using decimal numbers.*
   a. Demonstration of how to do the calculations. Handouts with discussion.
   b. Demonstration of how to do the calculations. Handouts with discussion.

c. Demonstration of how to do the calculations. Handouts with discussion.
d. Demonstration of how to do the calculations. Handouts with discussion.
e. Demonstration of how to do the calculations. Handouts with discussion.

3. Demonstrate the ability to do basic mathematical calculations related to machine shop operations.
a. Demonstration of how to do the calculations. Handouts with discussion.
b. Demonstration of how to do the calculations. Handouts with discussion.
c. Demonstration of how to do the calculations. Handouts with discussion.
d. Demonstration of how to do the calculations. Handouts with discussion.

Suggested Assessment Strategies:

1. Develop the ability to do mathematical operations using fractions.
a. Written test.
b. Written test.
c. Written test.
d. Written test.
e. Written test.
f. Written test.

2. Develop the ability to do mathematical operations using decimal numbers.
a. Written test.
b. Written test.
c. Written test.
d. Written test.
e. Written test.

3. Demonstrate the ability to do basic mathematical calculations related to machine shop operations.
a. Written test.
b. Written test.
c. Written test.
d. Written test.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 5: MEASURING TOOLS AND INSTRUMENTS (10 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to use and read a machinist rule.
   a. Read a rule to the nearest 1/32nd inch.
   b. Lay out lines with a rule.
   c. Describe the care and use of various rules.
   Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
   Workplace Skills (See Appendix B): WP5, WP6
2. Demonstrate the ability to identify and use the different types of micrometers.
   a. Identify common types of micrometers and their use.
   b. State the rules for use and care of micrometers.
   c. Make and read measurements with different micrometers.
   Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
   Workplace Skills (See Appendix B): WP5, WP6
3. Demonstrate the ability for the use and care of dial indicators.
   a. Explain the use of dial indicators.
   b. Identify when to use certain dial indicators.
   c. Explain the function of a dial indicator.
   d. Explain the procedures for the care of dial indicators.
   e. Take and record readings from different dial indicators.
   Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
   Workplace Skills (See Appendix B): WP5, WP6
4. Demonstrate the ability to use the height gauge.
   a. Explain the use of the height gauge and digital caliper.
   b. Explain the purposes of the height gauge and digital caliper.
   c. Discuss the care and maintenance of the height gauge.
   d. Take and record readings from the height gauge.
   e. Discuss the use of the electronic height gauge and digital caliper.
   f. Discuss care and use of a surface plate.
   Related Academic Topics (See Appendix A): C2, C5, C6, M4, M7
   Workplace Skills (See Appendix B): WP5, WP6

Suggested Teaching Strategies:

1. *Demonstrate the ability to use and read a machinist rule.*
   a. Handouts and discussion of the use of the rule.
   b. Demonstrate how to lay out line using the rule. Discussion on procedures.
   c. Handouts on the care and use of the rules. Discuss with the students.
2. *Demonstrate the ability to identify and use the different types of micrometers.*
   a. Discussion with handouts.

   b. *Discussion.*
   c. *Pass out a basic drawing, demonstrate, and discuss how to read measurements.*
3. *Demonstrate the ability for the use and care of dial indicators.*
   a. *Discussion.*
   b. *Discussion.*
   c. *Discussion.*
   d. *Discussion.*
   e. *Demonstration of taking and recording measurements.*
4. *Demonstrate the ability to use the height gauge.*
   a. *Discussion.*
   b. *Discussion.*
   c. *Demonstration of the care and maintenance of the height gauge.*
   d. *Demonstration on how to take and record readings.*
   e. *Discussion with handouts.*
   f. *Discussion with handouts.*

Suggested Assessment Strategies:

1. *Demonstrate the ability to use and read a machinist rule.*
   a. *Written test.*
   b. *Application test.*
   c. *Written/oral test.*
2. *Demonstrate the ability to identify and use the different types of micrometers.*
   a. *Written/oral test.*
   b. *Written/oral test.*
   c. *Give samples to be measured and recorded.*
3. *Demonstrate the ability for the use and care of dial indicators.*
   a. *Written/oral test.*
   b. *Written/oral test.*
   c. *Written/oral test.*
   d. *Oral test.*
   e. *Give samples to be measured and recorded.*
4. *Demonstrate the ability to use the electronic height gauge and electronic digital caliper.*
   a. *Oral test.*
   b. *Oral test.*
   c. *Oral test.*
   d. *Give samples to be measured and recorded.*
   e. *Written/oral test.*
   f. *Written/oral test.*

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 6: HAND AND BENCH TOOLS **(5 days)**

Competencies and Suggested Objectives:

1. Demonstrate the ability to identify hand tools and the rules for safe use of hand and power tools.
   a. Identify hand tools associated with machine tool operation.
   b. Identify safety rules associated with hand and power tools.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3
2. Determine the sizes of threads.
   a. State the safety rules in the use of thread cutting.
   b. Determine the sizes of drills from a chart and/or formulas.
   c. Produce internal threads by hand tapping.
   d. Produce external threads with a hand die.
   Related Academic Topics (See Appendix A): C1, C4, C5, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Demonstrate the ability to safely use bench and pedestal grinders.
   a. State the safety rules in the use of grinding wheels.
   b. Check a grinding wheel for cracks.
   c. Dress a grinding wheel.
   d. Grind a high speed tool bit.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
4. Demonstrate the ability to safely use band saws.
   a. State the safety rules in the use of band saws.
   b. Identify the types of power saws.
   c. List the factors which determine blade selection.
   d. Cut given stock with a horizontal band saw.
   e. Cut given stock with a vertical band saw.
   Related Academic Topics (See Appendix A): C1, C4, C5, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
5. Demonstrate the ability to safely use drill presses.
   a. State the safety rules in the use of drill presses.
   b. Identify the different types of drill presses.
   c. Explain the operations done on a drill press.
   d. List the factors which determine cutting speeds (rpm) for drilling.
   e. Drill and ream holes to layout.
   Related Academic Topics (See Appendix A): C1, C4, C5,M7
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Demonstrate the ability to identify hand tools and the rules for safe use of hand and power tools.*
   a. *Pass out hand tools and discuss their use.*
   b. *Pass out safety rules of the use of hand and power tools and discuss.*
2. *Determine the sizes of threads.*
   a. *Pass out safety rules for making internal and external threads and discuss.*
   b. *Use drill size chart and explain how to determine the size.*
   c. *Demonstrate the procedures for cutting internal threads by hand tapping.*
   d. *Demonstrate the procedures for cutting external threads with a hand die.*
3. *Demonstrate the ability to safely use bench and pedestal grinders.*
   a. *Pass out safety rules and discuss.*
   b. *Demonstrate and explain how to locate a damaged wheel.*
   c. *Demonstrate the procedures for dressing a damaged wheel.*
   d. *Demonstrate the procedure for grinding a high speed tool bit.*
4. *Demonstrate the ability to safely use band saws.*
   a. *Pass out safety rules and discuss.*
   b. *Tour the shop and discuss and demonstrate the use of various band saws.*
   c. *Discuss and explain the procedures for selecting the proper blade.*
   d. *Provide given stock and written instructions on how to cut the stock with a horizontal band saw.*
   e. *Provide given stock and written instructions on how to cut the stock with a vertical band saw.*
5. *Demonstrate the ability to safely use drill presses.*
   a. *Pass out safety rules and discuss.*
   b. *Tour the shop and discuss and demonstrate the use of various drill presses.*
   c. *Hand out material on the drill press and discuss the various operations.*
   d. *Hand out a chart showing the different cutting speeds and explain how to choose the correct one.*
   e. *Demonstrate the procedures for drilling and reaming holes to layout.*

Suggested Assessment Strategies:

1. *Demonstrate the ability to identify hand tools and the rules for safe use of hand and power tools.*
   a. *Written/oral test.*
   b. *Written test (100% accuracy).*
2. *Determine the sizes of threads.*
   a. *Written test. (100% accuracy).*
   b. *Provide problem and have students select the correct drill.*
   c. *Application using a checksheet and evaluation of final product.*

d. Application using a checksheet and evaluation of final product.

3. *Demonstrate the ability to safely use bench and pedestal grinders.*
   a. Written test (100% accuracy).
   b. Set problems and have students identify.
   c. Provide an out-of-balanced wheel and have students dress it.
   d. Provide students with high speed tool bit and directions on grinding, and evaluate the finished product.
4. *Demonstrate the ability to safely use band saws.*
   a. Written test (100% accuracy).
   b. Written/oral test.
   c. Written/oral test.
   d. Application. Check work for accuracy.
   e. Application. Check work for accuracy.
5. *Demonstrate the ability to safely use drill presses.*
   a. Written test (100% accuracy).
   b. Written/oral test.
   c. Oral test.
   d. Written test.
   e. Application. Check work for accuracy.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 7: BLUEPRINT READING **(10 days)**

Competencies and Suggested Objectives:

1. Demonstrate the ability to identify symbols, their abbreviations, and the alphabet of lines.
   a. Identify symbols used on blueprints.
   b. Identify abbreviations as used on blueprints.
   c. Identify the alphabet of lines.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Demonstrate the ability to identify and sketch the three principal views.
   a. Identify the top, front, and right side views.
   b. Sketch the third view when two views are given.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Demonstrate the ability to identify and use basic dimensions and tolerance.
   a. Identify the basic dimensions of a drawing.
   b. Place basic dimensions on a drawing.
   c. Identify tolerances on a drawing.
   d. Read tolerances on a drawing.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
4. Demonstrate the ability to list the types of information found in a title block.
   a. Identify the parts of a title block.
   b. Locate the various parts of a title block.
   c. Complete a title block.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Demonstrate the ability to identify symbols, their abbreviations, and the alphabet of lines.*
   a. Discussion. Pass out material and discuss with students.
   b. Discussion. Hand out material and discuss with students.
   c. Discussion. Hand out material and discuss with students.
2. *Demonstrate the ability to identify and sketch the three principal views.*
   a. Discussion and demonstration. Hand out material on three views.
   b. Demonstration on how to arrive at a third view when given two views.
3. *Demonstrate the ability to identify and use basic dimensions and tolerance.*
   a. Handouts and discussion on the use of basic dimensions.

b. Discussion and demonstration on dimensions and tolerances.
c. Discussion and hand out drawing with tolerances
d. Discussion and hand out drawing with tolerances.

4. *Demonstrate the ability to list the types of information found in a title block.*
   a. Pass out typical title block. Discussion of the parts.
   b. Pass out list of the types of information and discuss.
   c. Demonstration on completing a title block.

Suggested Assessment Strategies:

1. *Demonstrate the ability to identify symbols, their abbreviations, and the alphabet of lines.*
   a. Written test.
   b. Written test.
   c. Written test.
2. *Demonstrate the ability to identify and sketch the three principal views.*
   a. Written test.
   b. Written test. Provide students with basic drawing with one view missing and have students sketch the missing view.
3. *Demonstrate the ability to identify and use basic dimensions and tolerances.*
   a. Written test.
   b. Pass out basic drawing and have students to place dimensions and tolerances in correct place.
   c. Written test.
   d. Oral test.
4. *Demonstrate the ability to list the types of information found in a title block.*
   a. Written test.
   b. Written test.
   c. Written test.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 8: LATHES **(20 days)**

Competencies and Suggested Objectives:

1. Identify the parts, rules, and care of the engine lathe.
   a. Identify the major parts of the engine lathe.
   b. List rules for the safe use of the engine lathe.
   c. List rules for the care and cleaning of the engine lathe.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Describe the basic lathe operations.
   a. Explain the turning of a piece of stock.
   b. Describe how to chuck a piece of stock.
   c. Describe facing, center drilling, filing, tapping, and cutoff.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
3. Explain the advantages and disadvantages of carbide tip cutting tools and demonstrate how to free-hand grind a high speed steel (hss) turning tool.
   a. Discuss the advantages of carbide tip cutting tools.
   b. Discuss the disadvantages of carbide tip cutting tools.
   c. Explain the use of carbide tip cutting tools.
   d. Demonstrate how to free-hand grind an hss turning tool.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
4. Set up a lathe and determine the rpm and feed rate.
   a. Set up the lathe according to manufacturer's specifications.
   b. Explain the procedure for determining the rpm and feed rate.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6
5. Perform wet and dry cuts.
   a. Explain the procedures for making wet and dry cuts.
   b. Explain the differences between wet and dry cuts.
   c. Make wet and dry cuts.
   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Identify the parts, rules, and care of the engine lathe.*
   a. Handouts with discussion.
   b. Discussion with a handout on safety rules.
   c. Discussion and demonstration on the care.

2. *Describe the basic lathe operations.*
   a. *Demonstration.*
   b. *Demonstration.*
   c. *Demonstration.*
3. *Explain the advantages and disadvantages of carbide tip cutting tools and demonstrate how to free-hand grind a high speed steel (hss) turning tool.*
   a. *Handout with discussion.*
   b. *Handout with discussion.*
   c. *Handout with discussion.*
   d. *Demonstration with explanation.*
4. *Set up a lathe and determine the rpm and feed rate.*
   a. *Demonstration.*
   b. *Handouts with discussion.*
5. *Perform wet and dry cuts.*
   a. *Discussion.*
   b. *Discussion.*
   c. *Demonstration.*

Suggested Assessment Strategies:

1. *Identify the parts, rules, and care of the engine lathe.*
   a. *Written test.*
   b. *Written test with 100% accuracy.*
   c. *Written test.*
2. *Describe the basic lathe operations.*
   a. *Oral test.*
   b. *Oral test.*
   c. *Oral test.*
3. *Explain the advantages and disadvantages of carbide tip cutting tools and demonstrate how to free-hand grind a high speed steel (hss) turning tool.*
   a. *Written test.*
   b. *Written test.*
   c. *Written test.*
   d. *Application of the skill of grinding a turning tool.*
4. *Set up a lathe and determine the rpm and feed rate.*
   a. *Application of setting up a lathe.*
   b. *Oral test.*
5. *Perform wet and dry cuts.*
   a. *Written test.*
   b. *Written test.*
   c. *Application of making dry and wet cuts.*

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 9: LATHE OPERATIONS (40 days)

Competencies and Suggested Objectives:

1. Install a 4 jaw chuck on a lathe.
   a. Demonstrate safety procedures to be followed when installing a 4 jaw chuck.
   b. Install a 4 jaw chuck.

   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6
2. Operate the lathe.
   a. Mount and align a part in a 4 jaw chuck on a lathe to instructor's specifications.
   b. Perform a facing operation.
   c. Face a part to length.
   d. Perform a straight turning operation.
   e. Perform chamfer operations.
   f. Perform a center drilling operation.
   g. Perform a knurling operation.
   h. Perform a cutoff operation.
   i. Tap a blind hole.
   j. Cut external threads with a die on the lathe.

   Related Academic Topics (See Appendix A): C1, C4, C5, M4, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP5, WP6

Suggested Teaching Strategies:

1. *Install a 4 jaw chuck on a lathe.*
   a. Discussion on safety with handouts.
   b. Demonstration of installing a chuck.
2. *Operate the lathe.*
   a. Demonstration.
   b. Demonstration.
   c. Demonstration.
   d. Demonstration.
   e. Demonstration.
   f. Demonstration.
   g. Demonstration.
   h. Demonstration.
   i. Demonstration.
   j. Demonstration.

Suggested Assessment Strategies:

1. *Install a 4 jaw chuck on a lathe.*
   a. *Written test with 100% accuracy.*
   b. *Application with checklist.*
2. *Operate the lathe.*
   a *Application.*
   b. *Application.*
   c. *Application.*
   d. *Application.*
   e. *Application.*
   f. *Application.*
   g. *Application.*
   h. *Application.*
   i. *Application.*
   j. *Application.*

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 10: MILLING MACHINES (10 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to differentiate between the types of milling machines.
   a. Identify the different types of milling machines.
   b. Explain the use of each type of milling machine.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Explain and apply safety rules in the use of milling machines.
   a. Explain safety rules of milling machines.
   b. Discuss the application of safety rules for milling machines.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3, WP6
3. Identify the parts, cutting tools, and basic maintenance of a vertical milling machine.
   a. Identify the major parts of a vertical mill to include table, motor, ram, column, base, and knee.
   b. Identify the following cutting tools used on a vertical mill: double end two-flute end mill, four flute end mill, center drill, and fly cutter.
   c. Clean and lubricate a vertical mill following manufacturer's specifications.
   d. Determine the rpm and feed rate.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3, WP6
4. Identify the major parts of a horizontal mill and changing of the cutters.
   a. Describe the major parts including overarm, spindle, start/stop switches, overarm support, table, saddle, knee, elevating screw housing, base, knee motor drive, spindle reversing lever, high/neutral/low selector lever, and column.
   b. Change the cutters according to manufacturer's specifications.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Demonstrate the ability to differentiate between the types of milling machines*
   a. Discussion with handouts.
   b. Discussion.
2. *Explain and apply safety rules in the use of milling machines.*
   a. Handouts on safety rules.
   b. Discussion on each rule and its application.

3. *Identify the parts, cutting tools, and basic maintenance of a vertical milling machine.*
   a. *Discussion with handouts.*
   b. *Discussion with handouts.*
   c. *Demonstration of cleaning with discussion.*
   d. *Discussion with handouts to determine rpm and feed speed.*
4. *Identify the major parts of a horizontal mill and changing of the cutters.*
   a. *Discussion. Have students in shop and point out the major parts at the machine.*
   b. *Demonstration.*

Suggested Assessment Strategies:

1. *Demonstrate the ability to differentiate between the types of milling machines.*
   a. *Written test.*
   b. *Written test.*
2 *Explain and apply safety rules in the use of milling machines.*
   a. *Written test with 100% accuracy.*
   b. *Application of safety rules when on machine.*
3. *Identify the parts, cutting tools, and basic maintenance of a vertical milling machine.*
   a. *Oral/written test.*
   b. *Oral/written test.*
   c. *Oral/written test.*
   d. *Oral/written test.*
4. *Identify the major parts of a horizontal mill and changing of the cutters.*
   a. *Written test.*
   b. *Application of changing cutters.*

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION I/MACHINE SHOP I
UNIT 11: MILLING MACHINE OPERATIONS (20 days)

Competencies and Suggested Objectives:

1. Identify vertical milling machine operations and set up milling machine.
   a. Identify operations to include end milling, side milling, slotting, drilling, reaming, boring, and fly cutting.
   b. Set up a vertical milling machine for operation by mounting cutters and cutter holders, and mounting and aligning a swivel vise.

   Related Academic Topics (See Appendix A): C1, C4, C5, M7
   Workplace Skills (See Appendix B): WP2, WP3, WP4, WP6
2. Demonstrate the ability to perform operations on a milling machine.
   a. Perform a side milling operation to specifications.
   b. Perform an end milling operation to specifications.
   c. Perform a fly cut to specifications.
   d. Perform a surfacing/cutting operation with a horizontal mill to specifications.

   Related Academic Topics (See Appendix A): C1, C4, C5 ,M7
   Workplace Skills (See Appendix B): WP2, WP3, WP4, WP6

Suggested Teaching Strategies:

1. *Identify vertical milling machine operations and set up a milling machine.*
   a. Discussion with handouts on various operations.
   b. Demonstration and discussion.
2. *Demonstrate the ability to perform operations on a milling machine.*
   a. Demonstration.
   b. Demonstration.
   c. Demonstration.
   d. Demonstration.

Suggested Assessment Strategies:

1. *Identify vertical milling machine operations and set up a milling machine.*
   a. Oral/written test.
   b. Application.
2. *Demonstrate the ability to perform operations on a milling machine.*
   a. Application.
   b. Application.
   c. Application.
   d. Application.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION II/MACHINE SHOP II

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 1: ORIENTATION (2 days)

Competencies and Suggested Objectives:

1. Describe local program and vocational center policies and procedures.
   a. Describe local program and vocational center policies and procedures including dress code, attendance, academic requirements, discipline, and transportation regulations.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Describe employment opportunities and responsibilities.
   a. Describe employment opportunities including potential earnings, employee benefits, job availability, places of employment, working conditions, and educational requirements.
   b. Describe basic employee responsibilities.

   Related Academic Topics (See Appendix A): C1, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Describe local program and vocational center policies and procedures.*
   a. Review and discuss applicable rules and regulations.
2. *Describe employment opportunities and responsibilities.*
   a. Have students survey job opportunities through employer visits, resource person(s), telephone calls, and/or field trip with report to the class.
   b. Have resource person speak to students regarding requirements for the jobs, such as punctuality, customer relations, following directions, etc.

Suggested Assessment Strategies:

1. *Describe local program and vocational center policies and procedures.*
   a. Test on applicable rules and regulations.
2. *Describe employment opportunities and responsibilities.*
   a. Oral and written report on employment opportunities.
   b. Oral and written report on employee responsibilities.

Suggested References:

Local Administrative Policies and Procedures

MACHINE TOOL OPERATION I/MACHINE SHOP I I
UNIT 2: SAFETY **(3 days)**

Competencies and Suggested Objectives:

1. Describe personal safety rules for working in the machine tool industry.
   a. Identify and apply terms and definitions for safety.
   b. Identify provisions of the OSHA Act of 1970.
   c. Identify OSHA inspections and citations.
   d. Identify why citations are given.
   e. Identify accidents including their causes and prevention.
   f. Identify general safety procedures.
   g. Identify causes of electrical hazards.
   h. Identify proper methods for moving heavy items.
   i. Identify and apply emergency first aid, if necessary.
   j. Discuss Mississippi eye safety law and its requirements.
   k. Apply eye safety procedures.
   l. Discuss hazardous material regulations.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Describe personal safety rules for working in the machine tool industry.*
   a. Review and discuss applicable rules and regulations on safety.
   b. Pass out OSHA provisions and discuss with students.
   c. Discuss OSHA inspections and citations.
   d. Discuss why citations are given and how to prevent them.
   e. Describe accident procedures including getting help, basic first aid, and accident report form.
   f. Pass out safety tests and discuss with students. (Note: Safety tests must be passed with 100% accuracy.)
   g. Describe hazards of electrical shock including effects of current, shock avoidance techniques, and shock treatment procedures.
   h. Describe the proper procedure for moving heavy items.
   i. Review the basic requirements of emergency first aid.
   j. Review and discuss the state eye safety legislation.
   k. Describe how the eye safety procedures will be done.
   l. Review the hazardous material regulations.

Suggested Assessment Strategies:

1. *Describe personal safety rules for working in the machine tool industry.*
   a. *Oral and/or written exercise.*
   b. *Oral and/or written exercise.*
   c. *Oral and/or written exercise.*
   d. *Oral and/or written exercise.*
   e. *Oral and/or written exercise.*
   f. *Oral and/or written exercise.*
   g. *Oral and/or written exercise.*
   h. *Written and/or oral exercise.*
   i. *Written and/or oral exercise.*
   j. *Written and/or oral exercise.*
   k. *Written and/or oral exercise.*
   l. *Written and/or oral exercise.*

Suggested References:

Local Publication, Safety Handbook, Mississippi Eye Safety Regulations

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 3: ADVANCED LEADERSHIP (1 day)

Competencies and Suggested Objectives:

1. Develop advanced leadership and organizational skills.
   a. Identify VICA leadership and skills competition activities.
   b. Identify similarities between VICA leadership skills and workplace leadership skills.

   Related Academic Topics (See Appendix A): C5, C6
   Workplace Skills (See Appendix B): WP1, WP3, WP6

Suggested Teaching Strategies:

1. *Develop advanced leadership and organizational skills.*
   a. *Introduce VICA Professional Development Program (PDP). Give handouts on applicable skills competitions. Conduct first organizational meeting.*
   b. *Invite guest speakers from industry and State VICA officers to discuss leadership skills.*

Suggested Assessment Strategies:

1. *Develop advanced leadership and organizational skills.*
   a. *Observe VICA organizational skills.*
   b. *Oral/written report.*

Suggested References:

VICA. Official Guide for VICA. Washington, D.C.: Vocational Clubs of America (VICA).

MACHINE TOOL OPERATION II/MACHINE SHOP II **(2 days)**
UNIT 4: EMPLOYABILITY SKILLS

Competencies and Suggested Objectives:

1. Develop employability skills.
   a. Prepare a resume containing essential information.
   b. Complete a job application form.
   c. Explain procedures for job interviews using correct job etiquette.
   d. Demonstrate the role of an applicant in a job interview.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Develop employability skills.*
   a. *Assist guidance counselor in presenting resume writing.*
   b. *Assist guidance counselor or industry personnel manager in completing job application form.*
   c. *Assist guidance counselor or industry personnel manager in proper procedures for job interview.*
   d. *Role play job interviews with instructor, counselor, and/or personnel manager.*

Suggested Assessment Strategies:

1. *Develop employability skills.*
   a. *Evaluate student resume.*
   b. *Evaluate student job application.*
   c. *Observe role play.*
   d. *Oral and/or written report.*

Suggested References:

Textbooks, information from Mississippi Employment Security Commission, information from counselor, and/or information from personnel managers.

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 5: LAYOUT AND CONSTRUCTION (17 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to label tools, instruments, and procedures in performing a layout.
   a Label the tools and instruments used in performing a layout.
   b. Describe the factors to be considered in doing a layout.
   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Lay out and construct a project.
   a. Perform a layout to instructor's specifications.
   b. Construct a project using the instructor's approved layout.
   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Demonstrate the ability to label tools, instruments, and procedures in performing a layout.*
   a. Pass out tools and instruments while discussing the names and uses.
   b. Handouts on procedures and discussion.
2. *Lay out and construct a project.*
   a. Demonstration of how to perform a layout.
   b. Demonstration of how to construct a project. Hand out materials (Checklist).

Suggested Assessment Strategies:

1. *Demonstrate the ability to label tools, instruments, and procedures in performing a layout.*
   a. Written test.
   b. Application of constructing a project from a checklist.
2. *Lay out and construct a project.*
   a. Written test.
   b. Application of constructing a layout.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 6: ADVANCED LATHE OPERATIONS (47 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to perform tasks on the lathe.
   a Turn between centers.
   b. Turn a taper with a compound rest.
   c. Perform a boring operation.
   d. Cut V-sharp external threads.
   e. Pick up threads.
   f. Cut V-sharp internal threads.
   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Demonstrate the ability to perform tasks on the lathe.*
   a. Demonstration of how to turn between centers.
   b. Demonstration of how to turn a taper with a compound rest.
   c. Demonstration of how to perform a boring operation.
   d. Demonstration of how to cut V-sharp external threads.
   e. Demonstration of how to pick up threads.
   f. Demonstration of how to cut V-sharp internal threads.

Suggested Assessment Strategies:

1. *Demonstrate the ability to perform tasks on the lathe.*
   a. Application with a checklist.
   b. Application with a checklist.
   c. Application with a checklist.
   d. Application with a checklist.
   e. Application with a checklist.
   f. Application with a checklist.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 7: ADVANCED VERTICAL MILLING OPERATIONS (20 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to perform tasks on the milling machine.
   a Mill a key seat.
   b. Mill a given angle.
   c. Perform a straight boring operation.
   d. Align the head square to the table.
   e. Perform mill operation with head tilted to 45 degrees.
   f. Perform dividing head operations to instructor's specifications.

   Related Academic Topics (See Appendix A): C1, C4, C5
   Workplace Skills (See Appendix B): WP2, WP3

Suggested Teaching Strategies:

1. *Demonstrate the ability to perform tasks on the milling machine.*
   a. Demonstration.
   b Demonstration.
   c. Demonstration.
   d. Demonstration.
   e. Demonstration.
   f. Demonstration.

Suggested Assessment Strategies:

1. *Demonstrate the ability to perform tasks on the milling machine.*
   a. Application with checklist.
   b. Application with checklist.
   c. Application with checklist.
   d. Application with checklist.
   e. Application with checklist.
   f. Application with checklist.

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 8: SURFACE GRINDING MACHINES (20 days)

Competencies and Suggested Objectives:

1. Demonstrate the ability to utilize surface grinding machines.
   a. Define grinding machine operations.
   b. Identify different types of grinding wheels and their applications.
   c. List reasons for truing and balancing grinding wheels.
   d. Identify the major parts of a surface grinder and their functions.
   e. State rules of grinding machine safety.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Demonstrate the ability to set up and operate grinding machines.
   a. Set up a grinding machine to meet a specific job.
   b. Operate the controls of grinding machines as per instructor's specifications.
   c. Dress a wheel flat.
   d. Grind a piece flat and parallel.
   e. Grind a workpiece to instructor's specifications.

   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Demonstrate the ability to utilize surface grinding machines.*
   a. Discussion and handouts.
   b. Discussion and handouts.
   c. Handouts and explain.
   d. Discussion and handouts.
   e. Pass out safety directions and discuss.
2. *Demonstrate the ability to set up and operate grinding machines.*
   a. Demonstration.
   b. Demonstration.
   c. Demonstration.
   d. Demonstration.
   e. Demonstration.

Suggested Assessment Strategies:

1. *Demonstrate the ability to utilize surface grinding machines.*
   a. Application.
   b. Application.

c. *Application.*
d. *Application.*
e. *Written test with 100% accuracy.*

2. *Demonstrate the ability to set up and operate grinding machines.*
   a. *Application.*
   b. *Application.*
   c. *Application.*
   d. *Application.*
   e. *Application.*

Suggested References:

Dunn, James. Machine Shop I. Stillwater, OK: Oklahoma State Department of Vocational and Technical Education. 1981.

MACHINE TOOL OPERATION II/MACHINE SHOP II
UNIT 9: COMPUTERIZED NUMERICAL CONTROL (23 days)

Competencies and Suggested Objectives:

1. Develop the ability to describe CNC, including the codes and the input of a prewritten program.
   a. Describe the operations of CNC.
   b. Describe codes used in a CNC machine.
   c. Input a prewritten program into a PC.
   d. Print a hard copy of the program
   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6
2. Demonstrate the ability to operate a CNC lathe and CNC mill.
   a. Use software and monitor to debug the program.
   b. Download program to a CNC lathe and/or CNC mill.
   c. Execute the program on a CNC machine.
   Related Academic Topics (See Appendix A): C1, C3, C4, C6
   Workplace Skills (See Appendix B): WP2, WP3, WP6

Suggested Teaching Strategies:

1. *Develop the ability to describe CNC, including the codes and the input of a prewritten program.*
   a. Demonstration with handouts.
   b. Discussion.
   c. Demonstration with handouts.
   d. Demonstration with handouts.
2. *Demonstrate the ability to operate a CNC lathe and CNC mill.*
   a. Demonstration.
   b. Demonstration.
   c. Demonstration with handouts.

Suggested Assessment Strategies:

1. *Develop the ability to describe CNC, including the codes and the input of a prewritten program.*
   a. Application.
   b. Application.
   c. Application.
   d. Application.
2. *Demonstrate the ability to operate a CNC lathe and CNC mill.*
   a. Application.

b. Application.
c. Application.
d. Application.

Suggested References:

Selection of references for this unit will be dependent upon the CNC machines.

SECTION III:

RECOMMENDED TOOLS AND EQUIPMENT

RECOMMENDED TOOLS AND EQUIPMENT FOR MACHINE TOOL OPERATION/MACHINE SHOP

1. Lathes with accessories including digital readout (10)
   13" or 14" (8)
   15" x 60" (1)
   15" x 48" (1)
2. Vertical mills – 9" x 42' bed with accessories including digital readout (2)
3. Horizontal mill (1)
4. Surface grinder, automatic (1)
5. Vertical band saw – 20" (1)
6. Horizontal band saw – 10" (1)
7. Drill press – 20" minimum (with accessories) (1)
8. Hydraulic press – 25 tons (1)
9. CNC lathe mill (1)
10. Pedestal grinders (2)
11. Air compressor (1)
12. Blade welder (band saw) (1)
13. Work benches (6)
14. Vises (4") (6)
15. Dividing head (1)
16. Rotary table (1)
17. Drills (taper shank) (2)
18. Taper shank reamer (1)
19. Computers (2)
20. Printer (1)
21. Toll post grinder (1)
22. Exhaust system (1)
23. Height gauge (electronic) (1)
24. Surface plate – 24" x 36" (1)
25. Boring head and boring bar set (1)
26. Cutting torch (1)
27. Welding machine (1)
28. Arbor press (5 tons) (1)
29. Safety glass cabinet with safety glasses (1)
30. Drill set (3 in 1 set) 1/16 – ½ by 64ths, A-Z, and #1-#60 (3)
31. High speed steel drill and counter drill x 60 degrees – 5 piece set - #1-#60 (1)
32. High speed steel: 6 flute countersink 82 degrees – 8 piece set (⅛"-1") (1)
33. Hand reamers set: ⅛"-½" by 1/64ths (1)
34. Tap and die set, high speed steel – ¼-20 through 9/16 - 18 (1)
35. Metric screw pitch gage, Acme screw pitch gage, 60 degrees – V-sharp screw pitch gage (1 each)
36. Set end mill high speed steel ⅛"-¾" by 1/16" - 2" flute-center cut (double end) (1)

37. Single end ball end mill (4 piece set) ⅞" through 1½" (1)
38. Keyway broach set – ⅛" through ⅜" (1)
39. Horizontal milling cutter (set) per machine specifications (1)
40. Boring head with C.T. boring bar set (per machine specifications) (1)
41. Abrasive (shop roll) – 1' wide x 100 grit, 180 grit, 220 grit (1 each)
42. Buffing wheel and buffing compound (1)
43. Bench grinders (wheels) to machine specifications (3)
44. Surface grinder (wheels) to machine specifications (1)
45. Wheel dressing stick (1)
46. Grinder wheel dresser (1)
47. Cluster diamond dress for furnace grinder and holder (1)
48. Radius angle dresser, for surface grinder and diamonds (1)
49. Micrometers: 10 @ 0"-1": 5 @ 1"-2":2:2"-3": and 2 @ 3"-4" (19)
50. Depth micrometers: 2 @ 0"-6" (2)
51. Vernier calipers: 6" (2)
52. Dial calipers: 6" (6)
53. Digital caliper: 6" (1)
54. Set of gage telescopic 5/16"-6", 6 piece (1)
55. Set small hole: ⅛"-½", 4 piece set (1)
56. Dial indicators with magnetic base and 1" travel (2)
57. Sets – test indicators and surface gages (2)
58. Gage block set (rectangular) (1)
59. Angle plates (6"x6" and 3"x3") (2)
60. "V" block set (1)
61. Sine bar - 5" (1)
62. Precision grinding vise – ¼" (1)
63. Set steel parallel (10 pieces) ⅛" (1)
64. Combination square set (4 pieces) 4R graduation with 12" blades (10)
65. Set precision square set (4 pieces) (1)
66. Scales 6" – 4R graduation (20)
67. Drill point gage (1)
68. Plate protractors – 6" (4)
69. Radius gage set (1)
70. Acme thread gage set (1)
71. Center gages (4)
72. Spring calipers : inside, outside, and hermaphrodite – 3"x6" (2)
73. Dividers, 3" and 6" (2)
74. Edge finders (electronic) (3)
75. Level precision – 12" (1)
76. Trammel points (1)
77. Metal scribes (6)
78. Set, punch center, 8 piece (1)
79. Set, punch drive pin, 8 piece set (4" long) (1)
80. Combination wrench set (1)

81. Set (21 pieces) ½" drive socket set (1)
82. Set of pliers (1)
83. Set, pipe wrench (8", 10" and 12") (1)
84. Set, adjustable wrench (6", 10", 12") (1)
85. 25' power tape (1)
86. Screwdriver set (6 pieces) (1)
87. Set, demagnetized for surface grinder files – 12 with handles and file cards (1)
88. Dead blow hammers (2)
89. Ball peen hammers (2)
90. Pistol pump oilers (6)
91. Grease gun (1)
92. Sets, allen wrenches (metric and English) (4)
93. C-clamps – 6" (6)
94. Set, steel stamp: numbers and letters (1)
95. Electrical engraver (1)
96. Retractable air hoses and reels (3)
97. 4" grinder (1)
98. Air pressure regulator (1)
99. Drill motors (¼") (2)
100. Drill motor (½") (1)
101. Shop vacuum (wet and dry) (1)
102. Wheel dolly (4 wheels) (1)
103. Hack saws (6)

RECOMMENDED INSTRUCTIONAL AIDS

1. TV and VCR combination (1)
2. AV cart (1)
3. Teacher desks and chairs (2)
4. Filing cabinet (1)
5. Bookcase (1)

APPENDIX A:

RELATED ACADEMIC TOPICS

APPENDIX A

RELATED ACADEMIC TOPICS FOR COMMUNICATIONS

C1 Interpret written material.
C2 Interpret visual materials (maps, charts, graphs, tables, etc.).
C3 Listen, comprehend, and take appropriate actions.
C4 Access, organize, and evaluate information.
C5 Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.
C6 Communicate ideas and information effectively using various oral and written forms for a variety of audiences and purposes.

EXPANDED TOPICS FOR COMMUNICATIONS

TOPIC C1: Interpret written material.

C1.01 Read and follow complex written directions.
C1.02 Recognize common words and meanings associated with a variety of occupations.
C1.03 Adjust reading strategy to purpose and type of reading.
C1.04 Use sections of books and reference sources to obtain information.
C1.05 Compare information from multiple sources and check validity.
C1.06 Interpret items and abbreviations used in multiple forms.
C1.07 Interpret short notes, memos, and letters.
C1.08 Comprehend technical words and concepts.
C1.09 Use various reading techniques depending on purpose for reading.
C1.10 Find, read, understand, and use information from printed matter or electronic sources.

TOPIC C2: Interpret visual materials (maps, charts, graphs, tables, etc.).

C2.01 Use visuals in written and in oral presentations.
C2.02 Recognize visual cues to meaning (layout, typography, etc.).
C2.03 Interpret and apply information using visual materials.

TOPIC C3: Listen, comprehend, and take appropriate action.

C3.01 Identify and evaluate orally-presented messages according to purpose.
C3.02 Recognize barriers to effective listening.
C3.03 Recognize how voice inflection changes meaning.
C3.04 Identify speaker signals requiring a response and respond accordingly.
C3.05 Listen attentively and take accurate notes.
C3.06 Use telephone to receive information.

C3.07 Analyze and distinguish information from formal and informal oral presentations.

TOPIC C4: Access, organize, and evaluate information.

C4.01 Distinguish fact from opinion.
C4.02 Use various print and non-print sources for specialized information.
C4.03 Interpret and distinguish between literal and figurative meaning.
C4.04 Interpret written or oral communication in relation to context and writer's point of view.
C4.05 Use relevant sources to gather information for written or oral communication.

TOPIC C5: Use written and/or oral language skills to work cooperatively to solve problems, make decisions, take actions, and reach agreement.

C5.01 Select appropriate words for communication needs.
C5.02 Use reading, writing, listening, and speaking skills to solve problems.
C5.03 Compose inquiries and requests.
C5.04 Write persuasive letters and memos.
C5.05 Edit written reports, letters, memos, and short notes for clarity, correct grammar, and effective sentences.
C5.06 Write logical and understandable statements, phrases, or sentences for filling out forms, for correspondence or reports.
C5.07 Write directions or summaries of processes, mechanisms, events, or concepts.
C5.08 Select and use appropriate formats for presenting reports.
C5.09 Convey information to audiences in writing.
C5.10 Compose technical reports and correspondence that meet accepted standards for written communications.

TOPIC C6: Communicate ideas and information using oral and written forms for a variety of audiences and purposes.

C6.01 Give complex oral instructions.
C6.02 Describe a business or industrial process/mechanism.
C6.03 Participate effectively in group discussions and decision making.
C6.04 Produce effective oral messages utilizing different media.
C6.05 Explore ideas orally with partners.
C6.06 Participate in conversations by volunteering information when appropriate and asking relevant questions when appropriate.
C6.07 Restate or paraphrase a conversation to confirm one's own understanding.
C6.08 Gather and provide information utilizing different media.

C6.09 Prepare and deliver persuasive, descriptive, and demonstrative oral presentations.

RELATED ACADEMIC TOPICS FOR MATHEMATICS

M1 Relate number relationships, number systems, and number theory.
M2 Explore patterns and functions.
M3 Explore algebraic concepts and processes.
M4 Explore the concepts of measurement.
M5 Explore the geometry of one-, two-, and three-dimensions.
M6 Explore concepts of statistics and probability in real world situations.
M7 Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

EXPANDED TOPICS FOR MATHEMATICS

TOPIC M1: Relate number relationships, number systems, and number theory.

M1.01 Understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, percent, exponential, and scientific notation) in real world and mathematical problem situations.
M1.02 Develop number sense for whole numbers, fractions, decimals, integers, and rational numbers.
M1.03 Understand and apply ratios, proportions, and percents in a wide variety of situations.
M1.04 Investigate relationships among fractions, decimals, and percents.
M1.05 Compute with whole numbers, fractions, decimals, integers, and rational numbers.
M1.06 Develop, analyze, and explain procedures for computation and techniques for estimations.
M1.07 Select and use an appropriate method for computing from among mental arithmetic, paper-and-pencil, calculator, and computer methods.
M1.08 Use computation, estimation, and proportions to solve problems.
M1.09 Use estimation to check the reasonableness of results.

TOPIC M2: Explore patterns and functions.

M2.01 Describe, extend, analyze, and create a wide variety of patterns.
M2.02 Describe and represent relationships with tables, graphs, and rules.
M2.03 Analyze functional relationships to explain how a change in one quantity results in a change in another.
M2.04 Use patterns and functions to represent and solve problems.
M2.05 Explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations.

M2.06 Use a mathematical idea to further their understanding of other mathematical ideas.
M2.07 Apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as art, music, and business.

TOPIC M3: Explore algebraic concepts and processes.

M3.01 Represent situations and explore the interrelationships of number patterns with tables, graphs, verbal rules, and equations.
M3.02 Analyze tables and graphs to identify properties and relationships and to interpret expressions and equations.
M3.03 Apply algebraic methods to solve a variety of real world and mathematical problems.

TOPIC M4: Explore the concepts of measurement.

M4.01 Estimate, make, and use measurements to describe and compare phenomena.
M4.02 Select appropriate units and tools to measure to the degree of accuracy required in a particular situation.
M4.03 Extend understanding of the concepts of perimeter, area, volume, angle measure, capacity, and weight and mass.
M4.04 Understand and apply reasoning processes, with special attention to spatial reasoning and reasoning with proportions and graphs.

TOPIC M5: Explore the geometry of one-, two-, and three-dimensions.

M5.01 Identify, describe, compare, and classify geometric figures.
M5.02 Visualize and represent geometric figures with special attention to developing spatial sense.
M5.03 Explore transformations of geometric figures.
M5.04 Understand and apply geometric properties and relationships.
M5.05 Classify figures in terms of congruence and similarity and apply these relationships.

TOPIC M6: Explore the concepts of statistics and probability in real world situations.

M6.01 Systematically collect, organize, and describe data.
M6.02 Construct, read, and interpret tables, charts, and graphs.
M6.03 Develop an appreciation for statistical methods as powerful means for decision making.
M6.04 Make predictions that are based on exponential or theoretical probabilities.

M6.05 Develop an appreciation for the pervasive use of probability in the real world.

TOPIC M7: Apply mathematical methods, concepts, and properties to solve a variety of real-world problems.

M7.01 Use computers and/or calculators to process information for all mathematical situations.
M7.02 Use problem-solving approaches to investigate and understand mathematical content.
M7.03 Formulate problems from situations within and outside mathematics.
M7.04 Generalize solutions and strategies to new problem situations.

RELATED ACADEMIC TOPICS FOR SCIENCE

S1 Explain the Anatomy and Physiology of the human body.
S2 Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.
S3 Relate the nine major phyla of the kingdom animalia according to morphology, anatomy, and physiology.
S4 Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.
S5 Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.
S6 Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.
S7 Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance, population genetics, the structure and function of DNA, and current applications of DNA technology.
S8 Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

EXPANDED TOPICS FOR SCIENCE

TOPIC S1: Explain the Anatomy and Physiology of the human body.

S1.01 Recognize common terminology and meanings.
S1.02 Explore the relationship of the cell to more complex systems within the body.

S1.03 Summarize the functional anatomy of all the major body systems.
S1.04 Relate the physiology of the major body systems to its corresponding anatomy.
S1.05 Compare and contrast disease transmission and treatment within each organ system.
S1.06 Explore the usage of medical technology as related to human organs and organ systems.
S1.07 Explain the chemical composition of body tissue.

TOPIC S2: Apply the basic biological principles of Plants, Viruses and Monerans, Algae, Protista, and Fungi.

S2.01 Identify the major types and structures of plants, viruses, monera, algae protista, and fungi.
S2.02 Explain sexual and asexual reproduction.
S2.03 Describe the ecological importance of plants as related to the environment.
S2.04 Analyze the physical chemical and behavioral process of a plant.

TOPIC S3: Relate the nine major phyla of the kingdom animalia according to morphology, anatomy, and physiology.

S3.01 Explain the morphology, anatomy, and physiology of animals.
S3.02 Describe the characteristics, behaviors, and habitats of selected animals.

TOPIC S4: Explore the chemical and physical properties of the earth to include Geology, Meteorology, Oceanography, and the Hydrologic Cycle.

S4.01 Examine minerals and their identification, products of the rock cycle, byproducts of weathering, and the effects of erosion.
S4.02 Relate the Hydrologic Cycle to include groundwater its zones, movement, and composition; surface water systems, deposits, and runoff.
S4.03 Consider the effects of weather and climate on the environment.
S4.04 Examine the composition of seawater; wave, tides, and currents; organisms, environment, and production of food; energy, food and mineral resources of the oceans.

TOPIC S5: Investigate the properties and reactions of matter to include symbols, formulas and nomenclature, chemical equations, gas laws, chemical bonding, acid-base reactions, equilibrium, oxidation-reduction, nuclear chemistry, and organic chemistry.

S5.01 Examine the science of chemistry to include the nature of matter, symbols, formulas and nomenclature, and chemical equations.

S5.02 Identify chemical reactions including precipitation, acids-bases, and reduction-oxidation.
S5.03 Explore the fundamentals of chemical bonding and principles of equilibrium.
S5.04 Relate the behavior of gases.
S5.05 Investigate the structure, reactions, and uses of organic compounds; and investigate nuclear chemistry and radiochemistry.

TOPIC S6: Explore the principles and theories related to motion, mechanics, electricity, magnetism, light energy, thermal energy, wave energy, and nuclear physics.

S6.01 Examine fundamentals of motion of physical bodies and physical dynamics.
S6.02 Explore the concepts and relationships among work, power, and energy.
S6.03 Explore principles, characteristics, and properties of electricity, magnetism, light energy, thermal energy, and wave energy.
S6.04 Identify principles of modern physics related to nuclear physics.

TOPIC S7: Explore the principles of genetic and molecular Biology to include the relationship between traits and patterns of inheritance; population genetics, the structure and function of DNA, and current applications of DNA technology.

S7.01 Examine principles, techniques, and patterns of traits and inheritance in organisms.
S7.02 Apply the concept of population genetics to both microbial and multicellular organism.
S7.03 Identify the structure and function of DNA and the uses of DNA technology in science, industry, and society.

TOPIC S8: Apply concepts related to the scientific process and method to include safety procedures for classroom and laboratory; use and care of scientific equipment; interrelationships between science, technology and society; and effective communication of scientific results in oral, written, and graphic form.

S8.01 Apply the components of scientific processes and methods in classroom and laboratory investigations.
S8.02 Observe and practice safe procedures in the classroom and laboratory.
S8.03 Demonstrate proper use and care for scientific equipment.
S8.04 Investigate science careers, and advances in technology.
S8.05 Communicate results of scientific investigations in oral, written, and graphic form.

APPENDIX B:

WORKPLACE SKILLS

APPENDIX B
WORKPLACE SKILLS FOR THE 21ST CENTURY

WP1 Allocates resources (time, money, materials and facilities, and human resources).

WP2 Acquires, evaluates, organizes and maintains, and interprets/communicates information, including the use of computers.

WP3 Practices interpersonal skills related to careers including team member participation, teaching other people, serving clients/customers, exercising leadership, negotiation, and working with culturally diverse.

WP4 Applies systems concept including basic understanding, monitoring and correction system performance, and designing and improving systems.

WP5 Selects, applies, and maintains/troubleshoots technology.

WP6 Employs thinking skills including creative thinking, decision making, problem solving, reasoning, and knowing how to learn.

APPENDIX C:

STUDENT COMPETENCY PROFILE

STUDENT COMPETENCY PROFILE
FOR MACHINE TOOL OPERATION I/MACHINE SHOP I

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation

_____ 1. Describe local program and vocational center policies an procedures.
_____ 2. Describe employment opportunities and responsibilities.

Unit 2: Leadership and Personal Development

_____ 1. State procedures of leadership used to reach an agreement in an orderly manner and personal development opportunities provided students by the Vocational Industrial Clubs of America (VICA).
_____ 2. Identify desirable personal behavior and characteristics.
_____ 3. Identify legal requirements for participation in the occupation.

Unit 3: Safety

_____ 1. Describe personal safety rules for working in the machine tool industry.

Unit 4: Shop Math

_____ 1. Develop the ability to do mathematical operations using fractions.
_____ 2. Develop the ability to do mathematical operations using decimal numbers.
_____ 3. Demonstrate the ability to do basic mathematical calculations related to machine shop operations.

Unit 5: Measuring Tools and Instruments

_____ 1. Demonstrate the ability to use and read a machinist rule.
_____ 2. Demonstrate the ability to identify and use the different types of micrometers.

_____ 3. Demonstrate the ability for the use and care of dial indicators.
_____ 4. Demonstrate the ability to use the height gauge.

Unit 6: Hand and Bench Tools

_____ 1. Demonstrate the ability to identify hand tools and the rules for safe use of hand and power tools.
_____ 2. Determine the sizes of threads.
_____ 3. Demonstrate the ability to safely use bench and pedestal grinders.
_____ 4. Demonstrate the ability to safely use band saws.
_____ 5. Demonstrate the ability to safely use drill presses.

Unit 7: Blueprint Reading

_____ 1. Demonstrate the ability to identify symbols, their abbreviations, and the alphabet of lines.
_____ 2. Demonstrate the ability to identify and sketch the three principal views.
_____ 3. Demonstrate the ability to identify and use basic dimensions and tolerance.
_____ 4. Demonstrate the ability to list the types of information found in a title block.

Unit 8: Lathes

_____ 1. Identify the parts, rules, and care of the engine lathe.
_____ 2. Describe the basic lathe operations.
_____ 3. Explain the advantages and disadvantages of carbide tip cutting tools and demonstrate how to free-hand grind a high speed steel (hss) turning tool.
_____ 4. Set up a lathe and determine the rpm and feed rate.
_____ 5. Perform wet and dry cuts.

Unit 9: Lathe Operations

_____ 1. Install a 4 jaw chuck on a lathe.
_____ 2. Operate the lathe.

Unit 10: Milling Machines

_____ 1. Demonstrate the ability to differentiate between the types of milling machines.
_____ 2. Explain and apply safety rules in the use of milling machines.
_____ 3. Identify the parts, cutting tools, and basic maintenance of a vertical milling machine.
_____ 4. Identify the major parts of a horizontal mill and changing of the cutters.

Unit 11: Milling Machine Operations

_____ 1. Identify vertical milling machine operations and set up a milling machine.
_____ 2. Demonstrate the ability to perform operations on a milling machine.

STUDENT COMPETENCY PROFILE
FOR MACHINE TOOL OPERATION II/MACHINE SHOP II

Student: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation

_____ 1. Describe local program and vocational center policies and procedures.
_____ 2. Describe employment opportunities and responsibilities.

Unit 2: Safety

_____ 1. Describe personal safety rules for working in the machine tool industry.

Unit 3: Advanced Leadership

_____ 1. Develop advanced leadership and organizational skills.

Unit 4: Employability Skills

_____ 1. Develop employability skills.

Unit 5: Layout and Construction

_____ 1. Demonstrate the ability to label tools, instruments, and procedures in performing a layout.
_____ 2. Lay out and construct a project.

Unit 6: Advanced Lathe Operations

_____ 1. Demonstrate the ability to perform tasks on the lathe.

Unit 7: Advanced Vertical Milling Operations

_____ 1. Demonstrate the ability to perform tasks on the milling machine.

Unit 8: Surface Grinding Machines

_____ 1. Demonstrate the ability to utilize surface grinding machines.
_____ 2. Demonstrate the ability to set up and operate grinding machines.

Unit 9: Computerized Numerical Control

_____ 1. Develop the ability to describe CNC, including the codes and the input of a prewritten program.
_____ 2. Demonstrate the ability to operate a CNC lathe and CNC mill.